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ABSTRACT

This paper reviews some key trends revealed by a project on "Technological Change and Human Resources Development: The Service Sector" conducted by the Organisation for Economic Cooperation and Development. The project seeks to identify and analyze changes in labor markets, work organization, and skill requirements arising from the introduction of new technologies, particularly information technologies, at the enterprise level. Three questions are used as a framework for presentation: (1) what is the specific impact of new technologies on ongoing changes in the service sector?; (2) what are the implications of these new technologies on skill requirements of new entrants and participants into the service labor market?; and (3) what implications can be drawn from these changes for education and training policies? Discussion resulting from these questions leads to needs for policy development in five major areas: the functioning of labor markets in terms of flexibility; organizational structures for education and training; reform of curriculum and teaching practices; issues of adult learners and of illiteracy; and teacher preparation in response to changing expectations. (KC)

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WORKING DOCUMENT

HUMAN RESOURCES AND NEW TECHNOLOGIES:

ISSUES AND POLICIES

(Note by the Secretariat)

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HUMAN RESOURCES AND NEW TECHNOLOGIES: ISSUES AND POLICIES

Introduction

1. The CERI project on "Technological Change and Human Resources Development: The Service Sector" aims to identify and analyse changes in labour markets, work organisation and skill requirements arising from the introduction of new technologies, particularly information technologies, at enterprise level. This is the focus of our work, but the analysis will take into account structural adjustment and mutations in OECD economies.

2. New technologies of comparable nature are being rapidly introduced into most activities for both manufacturing and services; they are pervasive and generate clusters of innovations. They generally seem to require workers to adapt to less routine tasks, tend to define a new organisational structure in which team work and communication are crucial and imply new skills.

3. The results of those developments are far from uniform. The project's previous research on manufacturing shows that "changes in work content and related work skills are strikingly similar across enterprises and countries, while the strategies and processes of skill formation and their combination with changing employment patterns seem to vary considerably and require further analysis" (CERI, 1987).

4. These new technologies are not predetermined and bring about up and down skilling, increase and loosen control and enhance and reduce efficiency according to the strategies they serve. They are not value free and interact with the social and cultural framework into which they are introduced. Over time and in specific settings, they even tend to generate new "technocultures" which then influence strategic choices in work organisation or skill formation (Ford, 1988).

5. These observations provide a framework which enables us to look more closely at broad trends and specific examples of strategies in the service sector. This phase of our project has three different types of activities:

- a series of reports prepared by national teams in participating countries providing the necessary background information on general trends and statistical data. These reports focus particularly on retail, banking and business services for a more detailed analysis;
- a series of case studies conducted in firms implementing interesting strategies in the sub-sectors mentioned above;
- three reports of a more thematic nature, prepared by international teams and addressing respectively the specific problems of contingent workers,

innovations in training markets and the interface between public and private training providers.

6. This paper presents a review of some key trends revealed by this work and tries to identify research and policy issues. At this stage, it remains an interim report, to be discussed and redrafted before a final International Conference in November 1989. Three questions will be used as a framework for presentation:

- what is the specific impact of new technologies on on-going changes in the service sector?
- what are their implications for skill requirements of new entrants and participants in service labour market?
- what implications can be drawn from this for education and training policies?

THE IMPACT OF NEW TECHNOLOGIES ON THE SERVICE SECTOR

Between magnitude and diversity, is there a service sector?

7. The service sector is an essential part of OECD economies: in most member countries it now represents up to 60 or even 70% of the overall active population. It covers a wide range of public and private activities and is heterogeneous in employment growth rate, average enterprise size, share of investment, training strategies, skill requirements and job content (Bertrand and Noyelle, 1986).

8. Most services are intangible and are consumed soon after production. This has learning effects on the consumer, with the possibility even of partial appropriation of know-how and expertise in the process: for example some software users tend themselves to become "experts" and share their knowledge. This affects the supply function and could imply that demand for services is likely to be characterised by qualitative and quantitative evolutions as the service itself transforms the user and its needs.

The pervasiveness of services and the blurring effect

9. Statistics do not reveal the scope of service activities: these activities frequently occur ouside the formally defined "service sector". Industrial production includes an increasingly greater service content, not limited to delivery but extending to designing, marketing or customer service. "Non-process activities in the large, sophisticated manufacturing firms already use more than half of the labour resources, measured by hours of work" (Eliasson and Ryan, 1987). Measured by contribution to the value added by the average manufacturer, services might account for up to 80% (OECD Employment Outlook, 1988). In fact, many products owe a great part of their value to the services that accompany them: the software and data a computer diskette can store, for instance.

10. This phenomenon attests to the growing importance of commercial, marketing, and management or administrative functions in large manufacturing firms. At the same time, some service firms in banking or tourism, for instance, enter a more mature phase in their development and tend to standardise their products by pre-packaging them and become more capital-intensive. These trends, as well as the growing part of services in

employment and economic growth, contribute to the blurring of institutional and functional distinctions between manufacturing and services. The role of information and communication as fundamental material and process in competitive firms in either sector further reinforces this convergence. D. Kearns, CEO of Xerox, provides some sense of the linkage when stating: "although we sell and lease machines, they are not the most important part of our business. What we really sell are applied human intelligence. ingenuity, imagination. We sell solutions to communication problems" (Kearns, 1988).

11. This blurring seems likely to be a lasting trend, characterised by converging developments in organisational and structural changes, and leading to probably symbiotic and complementary, rather than competitive, relations between the two sectors. It is not easy to transpose these observations of emerging trends into conceptualised representations of the economy. If we want to better assess the role of services, we would need to somehow update national statistics and accounting systems which remain organised on the basis of clear-cut, three-sector economies. This would call for a two-level approach: that of categories, methods and quantitative techniques, as well as that of models and concepts of economic activity.

New technologies and other change factors in the service sector

12. New technologies -- and specifically information technologies and office automation systems -- have a tremendous impact on recent developments in the service sector. By providing managers with the efficient data processing tools they need, they enable them to implement changes with far reaching effects upon structures and products. In some respects, these changes exhibit fundamental characteristics close to that of manufacturing: in insurance for example, they contribute to the emergence of new, rationalised production processes. They also create new products and services: some of the new products in banking services and consumer credit would not have been possible without sophisticated data processing possibilities.

13. New technology has indirectly contributed to the shift towards a demand for quality rather than quantity of service. In response to client preference, greater attention is given to quality, and this changes the nature of competition in services. The pressure of demand is also visible in the importance given in services to customer-oriented attitudes such as opening hours in retail or personalised advice in selling insurance packages or investment portfolios.

14. Two other major developments which affect the production of services should be mentioned here because of their contribution to changes in competition and skill requirements formulation. The first one, internationalisation, is at present of particular relevance to banking, finance and telecommunications. In conjunction with new technologies, in these more advanced branches of the service sector internationalisation is one of the main factors behind major changes in markets and standards, products and process, job content and skill requirements. Other more protected branches of the service sector are gradually opening to external influences, with as yet more diffuse consequences. It seems that production and competition in services can no longer be analysed in strictly national frameworks.

15. The second element affecting both production and competition is deregulation. This is a relatively recent but general trend in OECD countries and might be a response to an expanding but ill-satisfied demand on saturated public markets. It entails the opening

up of new markets, and the effects on productivity growth, organisational changes in newly-privatised sectors or formulation of new demands might reveal some interesting trends for the future evolution of the service sector.

New technologies, services and employment

16. The service sector is the most dynamic sector in terms of net employment creation and has been since the 1970s. The pressing issues are: will new technologies add to or reverse this trend in job creation and will they change the skills required for available jobs?

17. When assessing these issues, we need to distinguish between visions (the ideal role of new technologies), current realities (do they support this vision?) and possibilities (how to create the social conditions that will alter the present path of technological application to make it more closely match our visions?) (Levin and Rumberger, 1987). We also need to account for both time and social interactions. Three factors deserve specific attention: productivity, the changing shape of both intermediate and final demand, and the role of externalising stategies.

18. Productivity is difficult to measure in service production, but many specific features of service employment and labour markets can be used to support the hypothesis of a productivity lag implying low paid and low qualified jobs. An undesirable side-effect of adaptation to change in the economy might then result in an increased percentage of part-time, contingent and low-skilled work, particularly for women, as the US data presented in the project seems to show.

19. Changing demand is one of the most active forces in service growth. It reflects major qualitative evolutions in what modern economies produce -- the final demand -- and in how they produce it -- the intermediate demand (Bertrand and Noyelle, 1986). The shift to two-income households brought about major changes in life styles and consumption patterns which contributed to the expansion of final demand. Service consumption represents an increasing part of that demand. These trends are useful to analyse in that they might help us anticipate the impact of future developments such as demographic prospects and the aging of most OECD populations on coming demand and employment creation in services.

20. Externalising -- the contracting out of certain tasks -- would seem to respond to two separate concerns: the desire to obtain better expertise and the need to drive down costs. This becomes more important in modern enterprises which function as networks where efficiency and yield are fundamental criteria and transaction costs a major determinant of production choices. The emerging "produce or externalise" alternative contributes to undermining the simple input/output relation and provides for flexible management strategies in the face of unstable markets and uncertain prospects. It can also be seen as a product of "organisational failure" (Stymne, 1989). In large firms, rigidities and particularly fixed wage structures are such that opportunity costs of internally conducting certain tasks are so high that contracting out is a more viable option. This is particularly true both of highly qualified specialists as well as of low-skilled workers performing more menial tasks.

21. The complex nature of these evolutions appears quite clearly in the specific case of business services. This branch of service activities has attracted wide attention in spite of

its small volume (roughly 5% of active population) because of its tremendous growth rate and because it best typifies changing relations between manufacturing and service. Yet it seems that some 60% of its growth can be traced to externalising effects so that the net creation rate is probably far lower than it appears. Externalising can therefore play a screening role and help what really is transformation or redeployment pass as creation.

22. Two other points should be noted in this brief overview of some characteristics of employment creation in the service sector. One is the very active role played by small and medium sized firms, which seems to go together with higher turnover rates and increased contingency of jobs. In France and Germany, for instance, between 1979 and 1984 these firms accounted for 80% of job creation in the services but also for 60% of suppression. The other point is the role of the public sector which represented a large part of employment creation and acted as buffer in recent slow-growth years. Deregulation and decentralisation policies, though, question the legitimacy of this role on economical -- lower productivity -- as well as on political grounds.

23. The factors summarised above and their evolution have important implications and bearings upon the future role and structure of the service sector. Their complexity points to the need to carefully assess aggregate data about employment creation in the services. However, some conclusions can be drawn.

Few certainties but many issues.

24. Forces shaping the future of the service sector and its role in the economy are multiple, varied and centrifugal. Given these contrasting factors and the insufficient state of data, analysis and conceptualisation, the basic question of the future number of jobs can only be partly answered. The driving force behind employment creation in the service sector is still elusive. If such factors as redeployment through externalising or low productivity are prominent, then growth is exogenous and will be linked to overall economic performance; if factors such as emerging new needs and demand provide endogenous impetus, then the sector has its own momentum. More work and research is needed, with particular attention to the issue of better and more complete data banks on the role of services in the economy and better integration of services in modelling and econometrics-based approaches. Notwithstanding these uncertainties, it seems likely that the service sector will be one of the main sources of employment creation over the next years. In most of the newer types of services, this will probably mean jobs requiring better qualifications along with higher pay.

25. In attempting to predict the number or level of jobs, one must distinguish between the short and the long term. In the long run, factors for upgrading are likely to be stronger than factors for downgrading the required skill level of jobs. In the transitional, short to medium term period, the process of adaptation might prove very disruptive and the effect on labour less certain. In any case, the pace at which technological change will affect net employment will depend in the last resort upon adaptative capabilities in the economy and the society which will determine the diffusion rate of the technologies (New technologies in the 1990s, 1988).

26. . One can, it seems, assume that in the short term there will be fewer jobs available for the low and least qualified, since this is where new technologies can most easily be applied. This corresponds to the trend already noted in manufacturing of technology first eliminating the least complex jobs. In the US, for instance, when scales of projected skill

of new entrants until year 2000 are matched with requirements for new jobs, it appears that over 75% of workers will compete for lower level jobs which will only represent 40% of new jobs, while the 40% of jobs requiring more than high-school education will be open only to 10% of workers.

27. The current relative stability of unemployment in Europe which coexists with a rise in registered vacancies suggests that the mismatch between the skills of the unemployed and those required for available jobs has worsened. "Long term unemployment persists together with employers' complaints about skill shortages, in spite of continuously rising levels of educational attainment and notwithstanding the diversification and expansion of vocational education" (OECD ED 88/20). This persisting trend calls for a policy mix aimed at raising the employability of the labour force, entrants and participants alike. With regard to overall labour market policies, this implies that while continued attention must be paid to income support, the more active policies must be given greater importance (OECD Employment Outlook, 1988).

IMPLICATIONS FOR SKILL REQUIREMENTS

28. What can we infer from this short survey of the skills required for the sustained development of the service sector? First and foremost is that there is no fixed relationship between the introduction of new technology and the level of skill required: new technologies in services can contribute to upskilling -- e.g. in banking -- but also to deskilling -- e.g. McDonald's cash register with pictures instead of words or figures. Second and almost equally important is that analyses of skill requirements must distinguish between long and short term effects and between macro, meso and micro levels of the sector. Thirdly, analyses and policy conclusions drawn from them cannot be made independent of broader socio-political contexts. For example, the existence and role of adaptive social policies favouring new technology will have an impact on skills requirements and particularly on skill formation. Similarly, at firm level, it is clear that the possibilities associated with technological change depend as much on the way in which they're incorporated into particular forms of organisation as on their characteristics. This is as much true for the skill requirement of jobs as for the productivity-raising potential. Fourthly, the effects of new technologies in the service sector seem to be less direct than those observed in the manufacturing sector and need to be analysed in light of other change factors (Bertrand and Noyelle, 1988).

29. The present transformation of work patterns is therefore neither a unilateral nor a uniform process. New technologies change the relative importance of distinct components of skill and job content, rather than absolute levels of skill requirement, and tend to shift organisational modes away from previously dominant models of Fordism and Taylorism. Some changes can be identified in the service sector, or at least in some of its branches: most notably a strong trend towards flattened hierarchy, increased reliance upon team work -- for instance the implementation of a team approach to better respond to customers' needs in a Swedish insurance firm (Frostenson, 1989) -- and greater emphasis on human resources management and training. There is also a clear trend towards decentralising decision-making in order to make it closer to the customer. This change in process requires decision-making skills at lower level and in more jobs than was the case previously.

Changing occupational structures

30. The overall economy is increasingly characterised, as we noted, by tertiarisation and upgrading. Within the service sector, there is a decline in demand for low-skilled jobs and an increase in demand for technology specialists who can provide the interface between suppliers and users. New technologies tend to increase the range of functions performed by operators and to reduce the frequency of interventions: the shift in emphasis is clearly from experience and dexterity to technical knowledge and vigilance. They reduce the need for a variety of human intervention for data handling: data-coding, keypunching, analysts and adjusters' functions can be integrated and assumed by multi-skilled workers. Technology can eliminate the need for the lowest clerical position and induce changes in middle-management's traditional role.

31. In general, the cumulative impact of new technologies is to shift the occupational structure form the traditional pyramid shape to a less familiar bulbous one. All in all, as noted in previous reports, it appears that "new technologies taken together with new modes of organisation tend to designate activities without any clear or stable profile" (Bertrand and Noyelle, 1986). It seems likely that there will be little or no entirely novel occupations, and that most existing jobs will be transformed by specialisation or increased versatility. Given the complexity of these changes, it seems reasonable then to infer that educational structures should not be be linked to concepts related to fixed occupational structures, but should rather retain flexibility with regard to such structures and the content of jobs.

Changing skill requirements

32. Changed structures and changed processes carry with them changing skill requirements. While some are similar to those expressed under comparable conditions in the manufacturing sector, some are service specific and related to the more unique trends we have identified. Prominent among these are interpersonal, information and organisation skills (Pathways for learning, 1989).

33. They reaffirm the importance of a good general education as a basis for the development of specialised competences. As the work environment becomes more abstract and empirical skills disappear, greater importance is given to the capability of applying theoretical knowledge to practical problems. High-tech companies specifically -- but most firms would agree -- explain that they don't need people with vocational education, but rather people who are broadly and deeply educated, with what is refered to as a liberal education, comprising both humanities and sciences as well as the ability to think, solve problems and take risks.

34. This new environment will increasingly require people to deal with non-routine tasks or to intervene when there is a problem to be solved: being a good problem-solver is often quoted in interviews as being essential for a worker. This reinforces the importance of personal, social and cognitive factors that produce broad qualities of flexibility, creativity, adaptability. It is sometimes further argued that a wider shift in emphasis from employee to entrepeneurial qualities is needed (Ball, 1988).

35. Willingness to learn and the capacity to shift between fuctions, firms and branches of the service sector are prerequisites for all employees. Continued technological innovation, the restructuring of enterprises and transformation of the processes of service

creation and delivery will increase the opportunity for employees to change what they do and for whom during their working lives. Some of these opportunities will become imperatives through job loss, deskilling and structural adjustments. Regardless of the source or quality of these opportunities, they all rely on employees capacity and willingness to learn new knowledge and take control of new processes. Again there are social, personal and cognitive dimensions to these qualities.

36. Other broader qualities or skills given enhanced value by technological change are team spirit, team work and good communication. Output of service is directly related to interpersonal relations and the result of sophisticated technologies might be a work force with a primary task of dealing with people either as customers or as colleagues. "Not only is the service economy 'knowledge-based' in terms of content, its setting is highly interactive. Pick and shovel is fairly solitary. But service work is people-oriented and require significant social skills" (Kearns, 1988). Initiative and a sense of responsibility are required as well as some sort of identification with the broad objectives of the group, which should be used as an ultimate perspective in decision making. Traditionally, the development of these qualities has been ascribed to a broad general education and with the common or comprehensive school. This long-standing ascription cannot be generalised without analysis to the whole population as it was usually associated with relatively small proportions of the student cohort going on to higher education, training or highly skilled jobs.

37. While requirements differ for groups of workers and branches of the service sector, these remarks can apply in some way or another to all groups and branches. Two important caveats should, however, be borne in mind. First, there's a distance between what is desirable -- e.g. creative people -- and the way in which this is being translated into corporate strategy through hiring and training procedures. Many hiring criteria for secretarial staff still value typing speed even though word processing makes this less relevant. Second, there's another disruptive factor in skill requirements as expressed by firms: the "skill myth". Enterprises sometimes have a tendency to over- or misstate their needs. This might be partly the influence of the milieu ("we need a higher educated labour-force" as a self-generating and self-justifying discourse) and partly lack of proper evaluation of their real needs. So we should be careful to distinguish between premises and implications when we delve into policy issues.

38. Most of what we can safely identify or infer from our surveys and case studies about skill requirement is expressed in broad characteristics and values. Across the branches and across different technologies the emphasis on individual qualities will vary. Similarly the level of analysis will also effect how the qualities are conceptualised and expressed. Work site (micro) analysis often emphasises particular skills, such as group work in manufacturing. Sector wide (macro) analyses are more likely to be more generalised or abstract. While these different analyses are rich and useful sources of data, it is more useful to try to summarise these different perspectives into broader policy frameworks. Two such frameworks are readily discerned in our data: the level of educational attainment and the distribution and development of higher order skill levels.

Raising educational attainments

39. Combined with internal factors of education systems, the shift in skill requirements and the demographic and social influences on the active workforce in coming years can have a substantial impact on the desired outcomes of education. There is

a general wish for increased educational attainments for the whole population, particularly for those groups which had left before the completion of secondary school. Many OECD countries have made better outcomes and raised standards a major goal of their education reform strategy. The solutions put forward vary but most aim at getting more young people through upper secondary school at least. This would amplify the continuing rise in educational attainment of the active population which has particularly benefited services. Further developments require major adaptation of the curriculum, the syllabus, the organisation and functioning of the initial education system, both public and private. The scope of change could be similar to that induced by the commitment to secondary level mass education in the 1950s. It can also be compared to the introduction, in a period not too dissimilar in terms of social, technical and economic change, of vocational education at the beginning of the 20th century when traditional apprenticeship structures inherited from guilds failed to provide industry with the relatively educated workforce it needed.

Higher order thinking skills for all?

40. Looking at these requirements, one cannot but be reminded of what higher level schools and universities have attempted to teach for centuries. They are basically what L. Resnick defines as higher order thinking skills: they involve "a cluster of elaborative mental activities requiring nuanced judgment and analysis of complex situations according to multiple criteria. Higher order thinking is effortful and depends on self-regulation. The path of action or correct answers are not fully specified in advance. The thinker's task is to construct meaning and impose structure on situations rather than expect to find them already apparent" (Resnick, 1987). Never before have these been a requisite for mass education, but many of those who reflect on the evolution of education advocate similar changes. They also point to the need for recognition that several types of intelligence exist, and that education should not be excessively geared towards one -- mathematics at present -- to the detriment of the others (Gardner, 1983; Bourdieu, 1985). Can systems, which are at present both blamed for falling or insufficient standards and structured to cater for elites, provide these skills?

41. Higher order skills are felt to be a general requirement, applying both to youth in education and to adults in the labour force, and this would imply different but co-ordinated strategies. Whatever the choices, higher order social skills should not be overlooked, as their importance is repeatedly stressed. These might prove to be even more difficult to reinforce, particularly for at-risk segments of the population who would need it most. An important question concerns the way in which education can address these skills: this seems to call less for specific "higher order thinking" courses than for changed notions of learning and teaching.

IMPLICATIONS FOR EDUCATION AND TRAINING POLICIES

42. International studies of this kind and in domains with such conceptual and data limitations as those we have recorded here restrain us from offering universally applicable policy formulas. This is even more so when the policy proposals are for the complex and contested domains of education and training. We can point though to aspects in education and training systems where change can and should be applied. This is a selective, and not an exhaustive approach.

Rethinking institutional organisation

43. The basic institutional question lies with the division of responsibilities in education and training. This has many possible branches: public/private; public/public, between education and labour institutions; initial/on-going; general/vocational. These may give rise to different arrangements and overlaps. It seems that there is little point for a dividing line in which the formal system would provide general education and private or informal programmes further and professional training. It does not reflect present arrangements, nor does it seem desirable in light of needed flexibility.

44. Given the broad skill requirements we have identified for the service sector, it would seem that they are best addressed by general education and that vocational courses are of less relevance for the services than they potentially are for manufacturing. In many countries, though, technical or vocational degrees with higher standards and greater "general culture" content are being created, sometimes in upper secondary schools traditionally devoted to general education, as part of higher attainment reforms. This would bring these courses closer to what is needed for service employment. Much, of course, depends upon the way these reforms are perceived and received in the industry and business world in particular, but in the long term they might have far reaching effects in changing social attitudes to technical learning and training.

45. Information on, and evaluation of the functioning of education systems have found their way into the public debate on education and training, losing some of their technicality in the process. This contributes to the development of indicator systems that can be used to monitor and assess present evolutions and policies. Most systems face strong demands for better accounting of public spending on education in terms of attainment of desired outcomes. This in turn implies that desired ends need to be clearly identified and agreed to by the community. This is also necessary if financing of education and training is to be diversified with greater direct and indirect financial involvement of the business world. This is not a simple matter of private enterprises providing or funding more or different types of education and training. The basic financing issues of how much? by whom? what for? will still need to be answered and the answers to these questions depend partly on those provided to the institutional ones. It is not a case for simple serial answers: the institutional and financial questions interact and shape the possible policy responses.

46. Institutions provide education, knowledge and culture and values. Much is made of the existence of fundamentally different orientations and values between business and education. Education is seen to focus on the individual and his or her personal growth as a citizen, as a member of a family and a community and then only as a "worker". Business is seen to adopt a more instrumental view. Whatever the relevance of these arguments towards explaining past policy approaches and their apparent limitations, developments in the service sector can no longer support such a simple dualism. The personal qualities and social and cognitive skills required by new technologies bring the value domains of work and education closer together, but discontinuities between in-school and out-of-school learning and difficulty in transferring school-based knowledge in order to apply it to work situations reinforce this dualism.

47. Developing relations between schools and their environment has always been considered as an integrating process. This can range from the simple site visit to more formalised and ambitious partnerships. In the US, where many such partnerships have

been established, these efforts have been criticised by some as too fragmented and uncoordinated or sporadic to bring about significant changes (Fortune, 1988; Business/Education Conference 1988). The principle that they're needed is not questioned, but they call for less simplistic approaches in order to be more efficient. Greater efforts at institutionalising, evaluating and coordinating successful innovations for potential replication would be necessary.

48. Another often advocated possibility is developing policies designed at facilitating the transition through work experience for youth in education. Little is known at present about the precise effects of such work experiences and more appraisal is needed, but what evidence exists is contradictory. In the US, where work experience is usually unrelated to school programmes, it does generally ease insertion but to the detriment of educational attainments and later employment and career prospects. In other countries which implement such policies with strong links with the education systems, results tend to be more positive overall.

49. Given this contrasting assessment, it seems that these initiatives or programs would be more beneficial if specific attention is given to type and quality of jobs involved, as well as built-in links with schools via varied forms of supervision and assessment so as to maximise learning and transfer effects. Linkages with other labour makets or education programs are also necessary in order to avoid redistributing unemployment of youth and young adult by putting the least-skilled at a further disadvantage.

Curriculum and content

50. Does the service sector have specific educational requirements beyond those attitudes and skills we identified earlier ? Is there a "service" knowledge-base that could be distinguished from an industrial one, or is there a trend towards integration of both in a "post-industrial" one including both general, scientific and technological culture? This fundamental question deserves more research. Some elements can be identified, but reform should not result in burdening of the curriculum by adding more onto existing syllabus and academic requirements. What seems to be called for is rather a reshaping and refocusing of school-based knowledge. The learning patterns should aim at reflecting the complexity and uncertainty of real world situations, take into account and balance: the need for greater economic relevance, the impact of new technologies, the growing trend towards internationalisation, the growth of multi-cultural societies and the new emphasis on human development.

51. The curriculum and school-career paths should be organised in such a way as to provide every school-leaver with the threshold skills, or core competences, that are prerequisites to insertion into working and social life and prevent functional illiteracy. These would include basic literacy and numeracy, reasoning and communication skills, work values and attitudes as well as the ability to effectively learn new skills. These are minimum requirements, even for the lowest level service sector job in a complex society.

52. In a growing number of school systems, technology and/or computer science are being included in the curriculum at secondary level, both for general and vocational education (New information technologies, 1986). This could help bring about the "computer literacy" many enterprises feel they require. This should not be seen in too limited a way: what seems to be needed is an incorporation of broader technological issues into the curriculum, aiming at technology rather than computer literacy. This

would include historical perspectives, alternative strategies for use, and the social and economic consequences of these developments. The important aspect is to avoid an instrumental approach which would exclude an understanding of social and economic implications.

53. This broader conception of technology literacy should blend into an expanded notion of the culture provided by liberal education, which needs to reflect more scientific and technological issues in a critical perspective. The aim should not be to teach a new set of values and ethics, but rather to enable students to integrate scientific information and derive ethical judgments. This revised culture should also fully take into account the effect of internationalisation and increased cross-cultural transfer of technologies.

54. In terms of attitudes -- an essential component of service sector skill requirements -- curriculum should aim at reinforcing the attitudes sought and valued by service sector employers. This is more a matter of teaching practices and of patterns of knowledge transmission than of content, but schools are ill-prepared for this. Recent reforms in the state of California show that it is easier to upgrade the curriculum and implement tougher tests than it is to change the nature of pedagogy. Traditional teaching methods are implicitly supported by a social framework in which "unlicensed", daily learning situations follow very conservative patterns, and it has been suggested that "traditional teaching in schools echoes and reflects popular practices outside schools" (Cohen, 1988). Reform here occurs at the edge of deep-rooted social practices, and generalised and accepted changes in school practices will only take place if synchronised with similar changes in social practices.

55. The attitudes and personal skills and qualities discussed above are influenced and shaped by the ethos, processes and content of education. While they cannot be taught, they can be reinforced and developed. They can and must be more systematically and consciously addressed in the ways learning is organised, delivered and evaluated. This would imply that the learning pattern is important in its own right and that attention should be given to it in the same way as it is given to outcomes. This could have some bearings on the debate of quality in education: improving the quality of outcomes might have to progress by improving the quality of processes.

Teachers

56. With regard to teachers, issues are possibly less specifically related to technological change and more common to broader reform movement and general concern about the quality of education and teaching. Much has been said in that respect in favour of a less exclusively academic training and greater exposure to "real world" situations, and this would certainly help in bringing education and business closer together; it would also help in facilitating shifts in teaching practices.

57. This very general concern can perhaps be broken down in specific and pressing issues for policy development:

- -- upgrading technological knowledge and confidence of existing teachers;
- -- promoting through in-service education the systematic development of the qualities sought;

- -- changing training of teachers from entering the profession directly from school and university, so as to provide for non-teaching work experience at some point;
- -- finding and valuing alternative entrance paths to teaching in order to insure diversity of teachers' supply;
- -- using teaching resources from the service sector to make learning more situated and relevant.

58. These issues, which have been taken up in OECD work on condition of teaching (1989) and in major commentaries by researchers such as Darling-Hammond or Goodlad, have massive resource implications. Policy development will need to take these implications fully into account.

Specific policy framework for adult learners

59. Changes in employment growth and derived skill requirements increase the need for training and retraining. Sophisticated and complex skill requirements of the service sector type are not easily abstracted and translated into textbook learning; they demand situated learning in a technologically relevant environment. This training cannot occur without a core-knowledge base.

60. Training is both a vital necessity and extremely difficult to deliver for those approximately 20% of adults who, in industrialised countries, remain functionally illiterate. They are the ones new technologies and related changes put at a greater risk, and also the ones who will not profit from them unless basic literacy skills are provided. This probably can only take place with difficulty in corporate settings, although some countries run successful work-based literacy programs, and public education has a major preventive and remedial role to play in that respect. Adult illiteracy deserves special treatment because of its far-reaching individual and collective socio-economic effects. Programmes should aim at results (basic literacy and numeracy) and achievements, but should not neglect behaviours and attitudes towards the written material. Studies have shown that greater social and economic benefits are derived from literacy in use, not just potential literacy.

61. Enterprise training is often criticised on the basis of the non-transferability of skills provided, since its primary aim is to respond to internal needs. Research for this project, particularly the US data, tends to show that a greater problem might be its tendency to exclude from schemes those categories of the labour force needing it most: unemployed people, minorities, women, underskilled adults. Enterprises tend to cater to the needs of their labour force. The segmentation of labour markets is thus reflected in the segmentation of training opportunities, with those working part-time, in contingent jobs or in small and medium sized firms facing increased problems. Some balance has to be provided, possibly by recognising the primary responsibility of firms in providing for their workforce, while governements and non-profit institutions would supplement this with customised programs for at-risk populations. In terms of financing, this would translate into similar sharing of costs, with some participation by individuals when possible and perhaps encouraged by specific tax schemes.

Emerging trends for the 1990s

62. Education policy tends at present to move away from the broad sphere of social policies to be integrated into the economic sphere (Neave, 1988). This is not in itself necessarily negative; it is the clear expression of new options in changing societies. We need to fully understand and appreciate the implications of this move and consciously choose the way in which such new preoccupations are taken into account.

63. Other structural trends with an impetus outside education systems must also be assessed. One example is decentralisation. Within the OECD, highly centralised countries feel the need for decentralisation and more autonomy both at local and school level while traditionally decentralised countries with a long history of limited central government involvement in education move towards greater central control over core curricula and standards. These trends are consistent with the direction of changes in the service sector. The press for decentralisation focuses on placing educational or professional decisions in the hands of teachers so they can adapt their pedagogy and lesson content to the needs and strengths of their students. This parallels the move to give workers more autonomy in the production process. The centralising tendency is to ensure that education occurs within a common framework so that the quality of service is comparable. It may be interesting and profitable to speculate on the wider implications of service sector developments for the ways teaching and learning are organised and delivered.

64. Nothing could be further from reality than assuming no innovations have emerged in direct or indirect responses to these changes. With the exception of policies aimed at raising educational attainments, these innovations usually take place in the margins of the system or even outside it and are not yet integrated into the mainstream. Most of them arose from an initial initiative of a few committed individuals or enterprises. While the trends are real and represent worthwhile efforts on the part of both education systems and their partners, they are not comprehensive. The lack of coordination, of coherence, of evaluation is striking. Initiatives and willingness to "do something" exist, but through lack of support and flexibility end up providing solutions that are contextually specific, piecemeal and do not always use resources optimally.

65. These issues call for the development of a new interface between multiple public and private actors and a diversified policy mix. There can be no prescribed form for intervention beyond a basic principle of co-operation. The forms of provision are varied and will depend upon social, cultural and economic characteristics. They should also be highly volatile: one of the strong lessons of the present crisis in education is that systems have been unable to evolve and grow beyond the historical context of their creation, which justified traits that today ensure their consistency but also act as constraints and contribute to this loss of meaning in education. The very real risk otherwise is to see the pendulum swinging excessively towards an economic management of education, with reforms exclusively driven by economic justifications and forced upon those in education who will have to implement them, having had no say in their shaping.

Conclusions

66. In summarising, five major areas can be identified:

-- the functioning of labour markets with special reference to flexibility choices;

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- -- organisational structures for education and training, taking into account the emerging interface between public and private providers;
- -- curriculum and teaching practices as areas for reform;
- -- the specific issue of the adult learner and of illiteracy;
- -- the question of teacher preparation in response to changing expectations.

It is these domains particularly which should be addressed by further research and policy developments.

67. If only one major conclusion had to be chosen from our work, it would be that of the undetermined nature of technology related change in employment patterns and skill requirements. This might be more strongly the case for the service sector than for the rest of the economy. The most important determinants in shaping future labour markets and occupational structures are the adaptative strategies that the need for flexibility will engender.

68. They need not exclusively entail contingent and deskilled work through Darwinian-like external flexibility choices; increased internal flexibility, through generalised training and retraining, can be set and encouraged as a complementary, balancing goal. Flexibility is the meeting ground for macro-level labour market policy and micro-level enterprise strategy as well as for changes in education and training policies aimed at better provision of skills required for available and future jobs. Those options will shape future employment opportunities and characteristics.